Low Carbon Fuel Standard
Life Cycle Analysis (LCA) Working Group 1 Meeting

January 17, 2008

California Environmental Protection Agency

Air Resources Board

Agenda

- Introductions
- GREET Training Update
- Presentation of values for Co-products
- Status of Land Use Change Issues
- Presentation by UC Berkeley
- Presentation by Univ. of Nebraska, Lincoln
- Other Stakeholder Presentations
- Presentation of various Fuel Pathways
- Sustainability Issues
- Other items to be discussed

GREET Training

- GREET Training for stakeholders on February 14, 2008 at the California Energy Commission
- Agenda has been posted online
- Expect comments by stakeholders latest by January 31, 2008

Co-product Credit Methodology

Preliminary Staff Recommendation for Co-product Credits* (in gCO_{2e}/MJ)

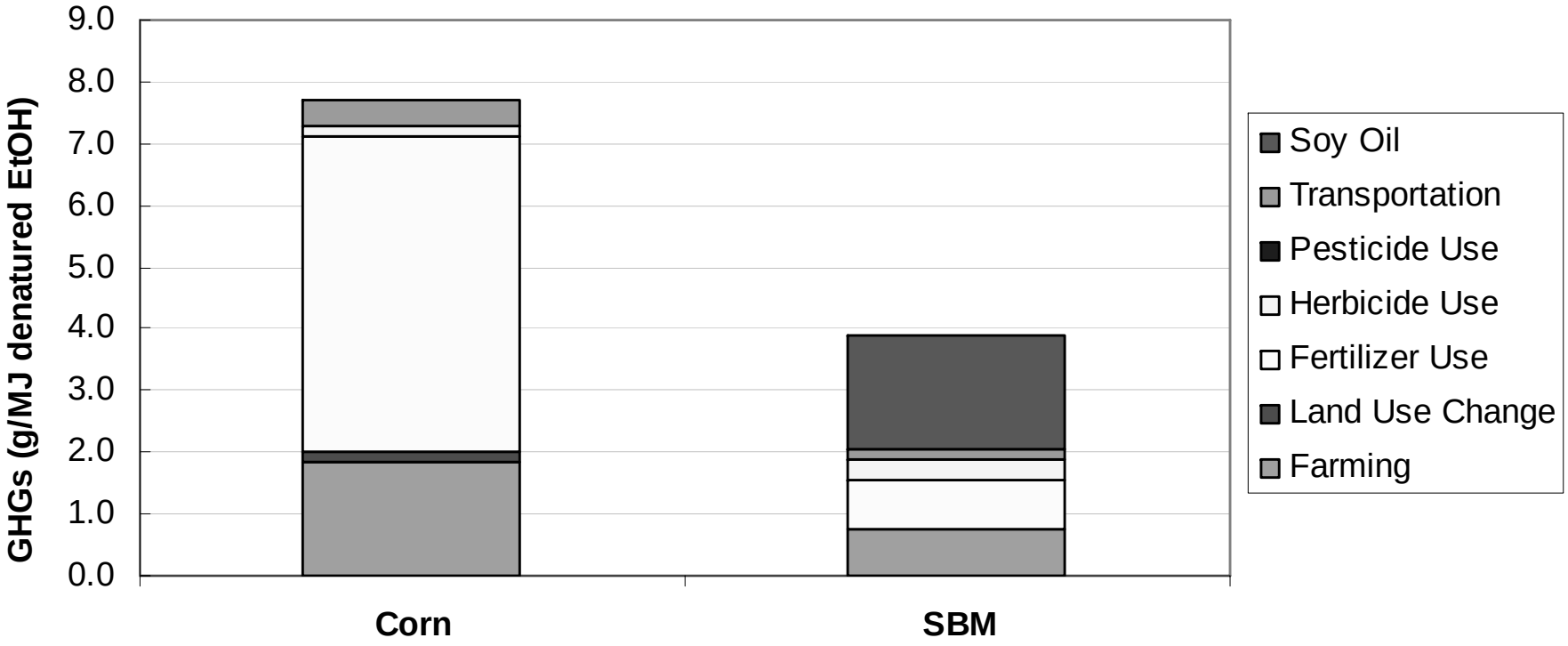
	Corn Ethanol (U. S.) Dry mill	Corn Ethanol (U. S.) Wet Mill	Stover to Ethanol (U. S.)	Soy Biodiesel (U. S.)
Animal Feed	9.5	17.7		28.3
Electricity			3.0	
Glycerin				5.0

*values and methodology from GREET, Analysis by Life Cycle Associates. Electricity credit based on 1 kWh/gal ethanol, 792 g/kWh for US Average electricity in Midwest, For plants in CA, GHG impact of marginal generation is 400 g/kWh.

Co-product Credit Methodology for DDGS from Dry Milling Process

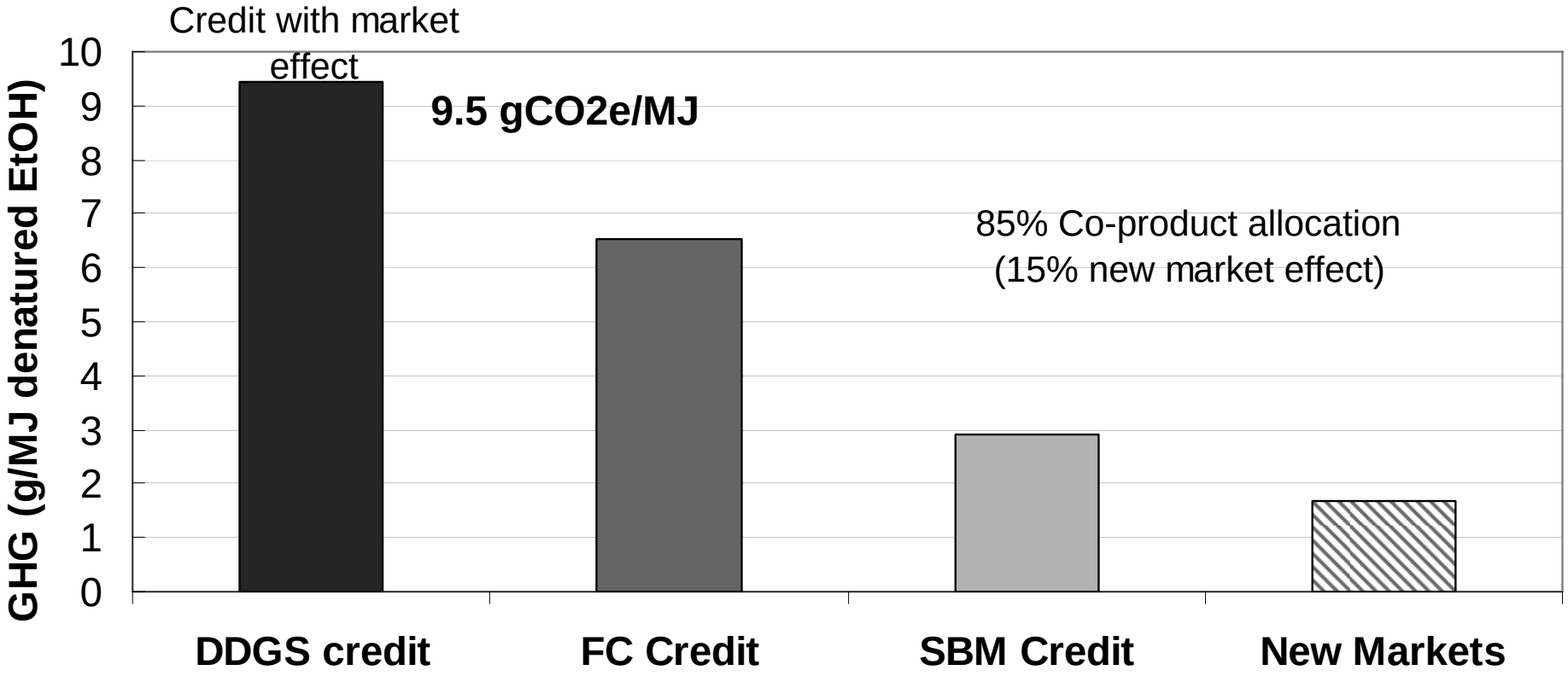
- DDGs is a co-product from dry milling ethanol process
- Replaces Feed Corn (FC) and Soy Bean Meal (SBM)
- Calculate LC emissions for FC and SBM
- Credit DDGS for equivalent emissions from FC and SBM

Life Cycle Emissions for Feed Corn (FC) and Soy Bean Meal (SBM)



Analysis by Life Cycle Associates, GHG Impact does not include effect of DDGS on feed markets.

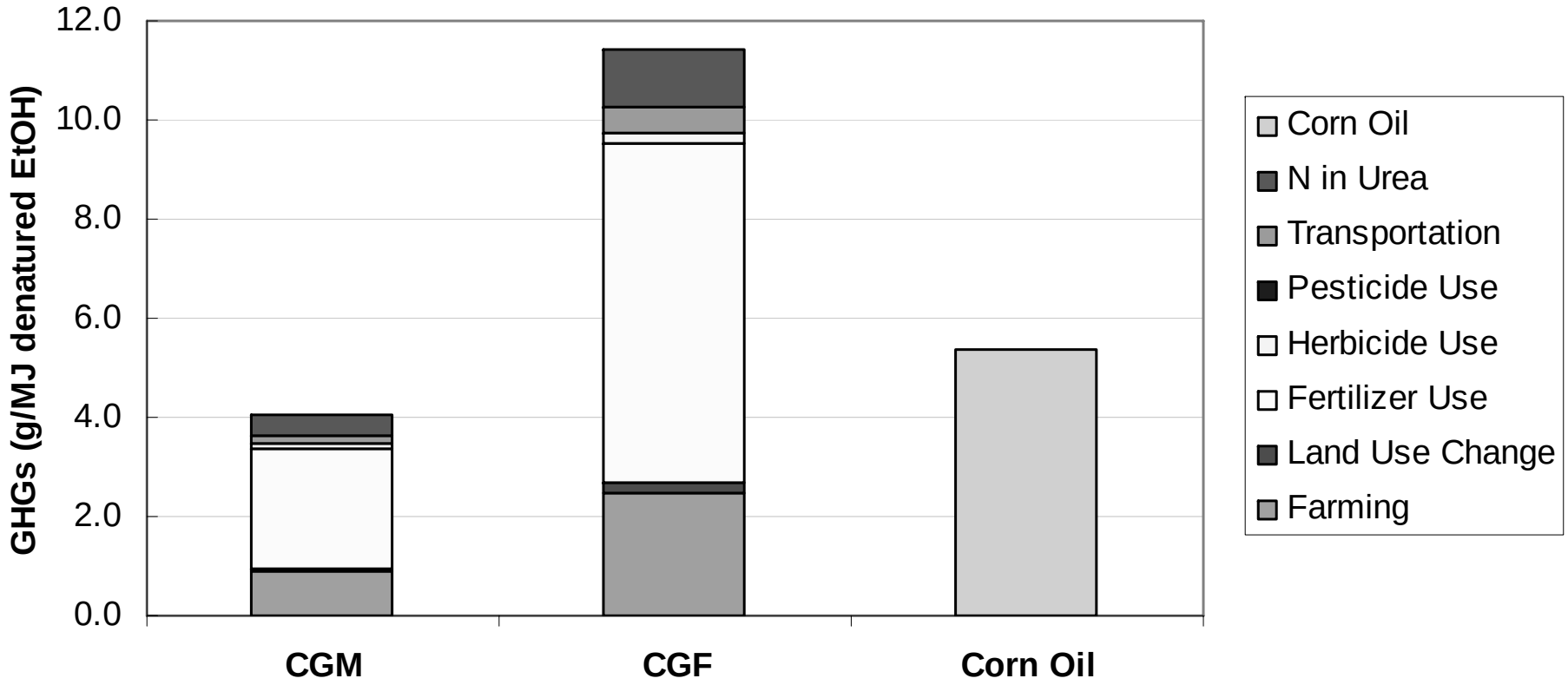
Overall Co-product Credit for DDGS from Dry Mill Corn Ethanol



Analysis by Life Cycle Associates

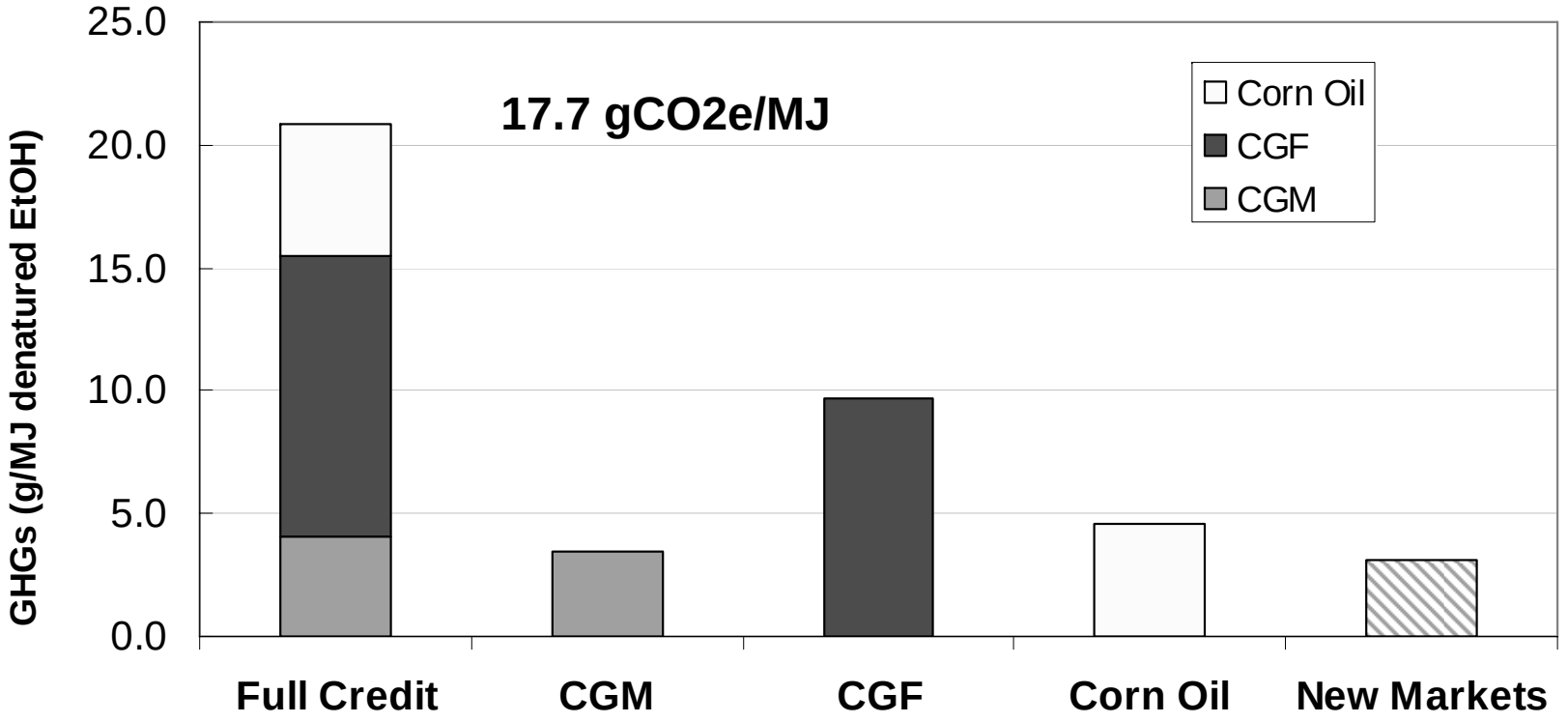
Co-product Credit Methodology for Wet Milling Process

Life Cycle Emissions for Corn Gluten Meal (CGM), Corn Gluten Feed (CGF) and Corn Oil



Analysis by Life Cycle Associates

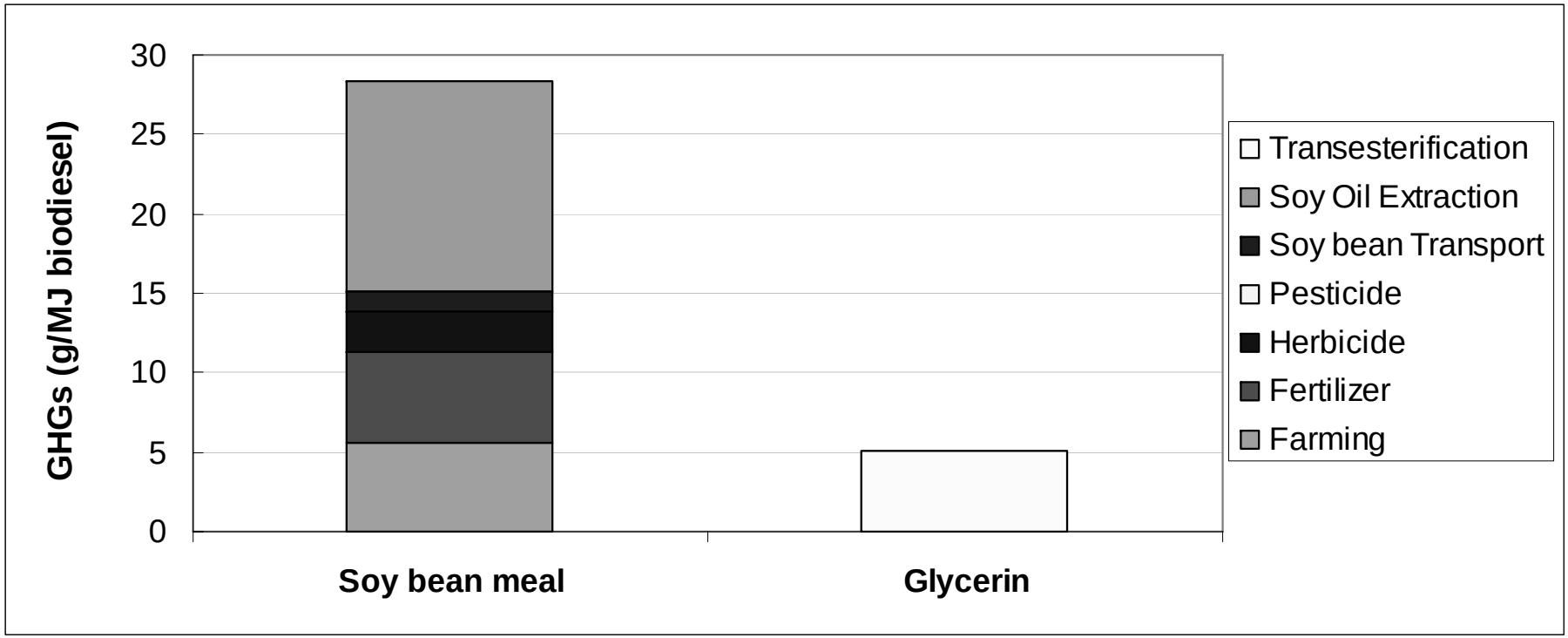
Overall Co-product Credit for Wet Mill Corn Ethanol



Analysis by Life Cycle Associates

Co-product Credit Methodology for Soy Biodiesel Process

Life Cycle Emissions for Soy Bean Meal and Glycerin



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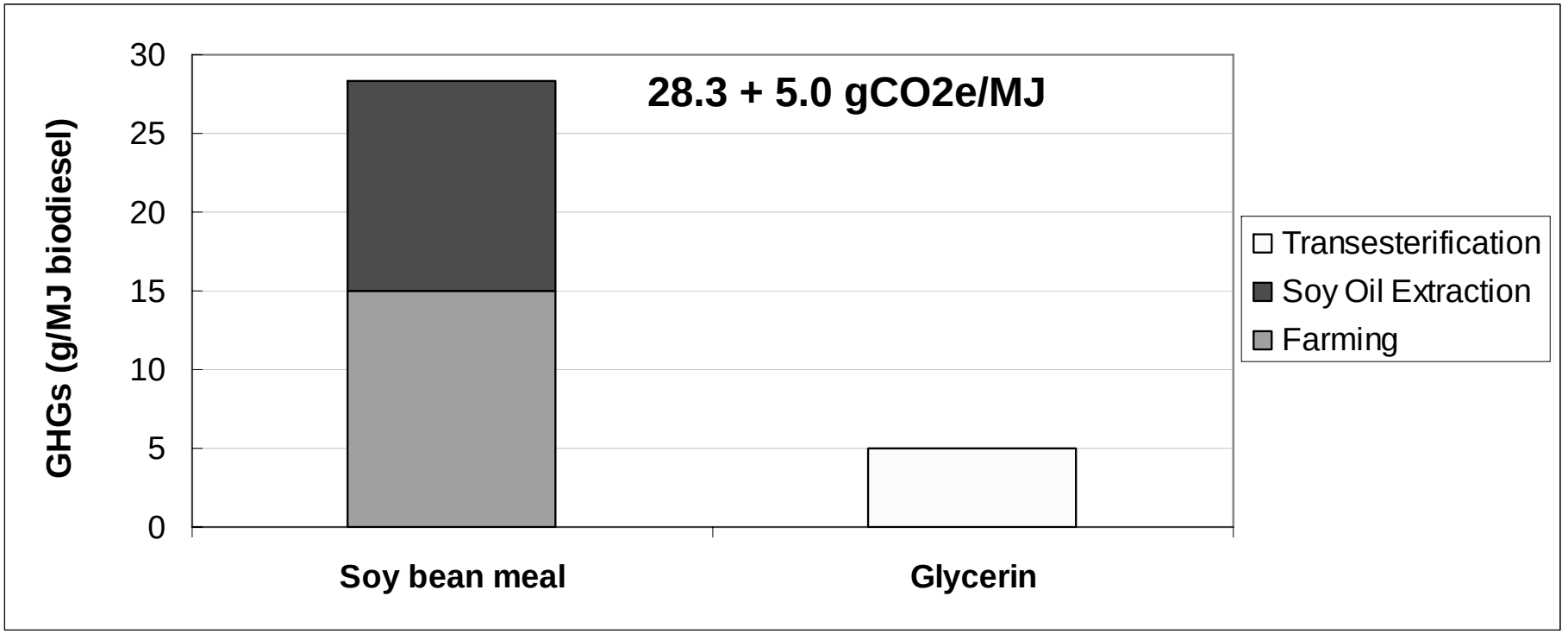
Overall Co-product Credit for Soy Biodiesel



Analysis by Life Cycle Associates

Electricity Co-product

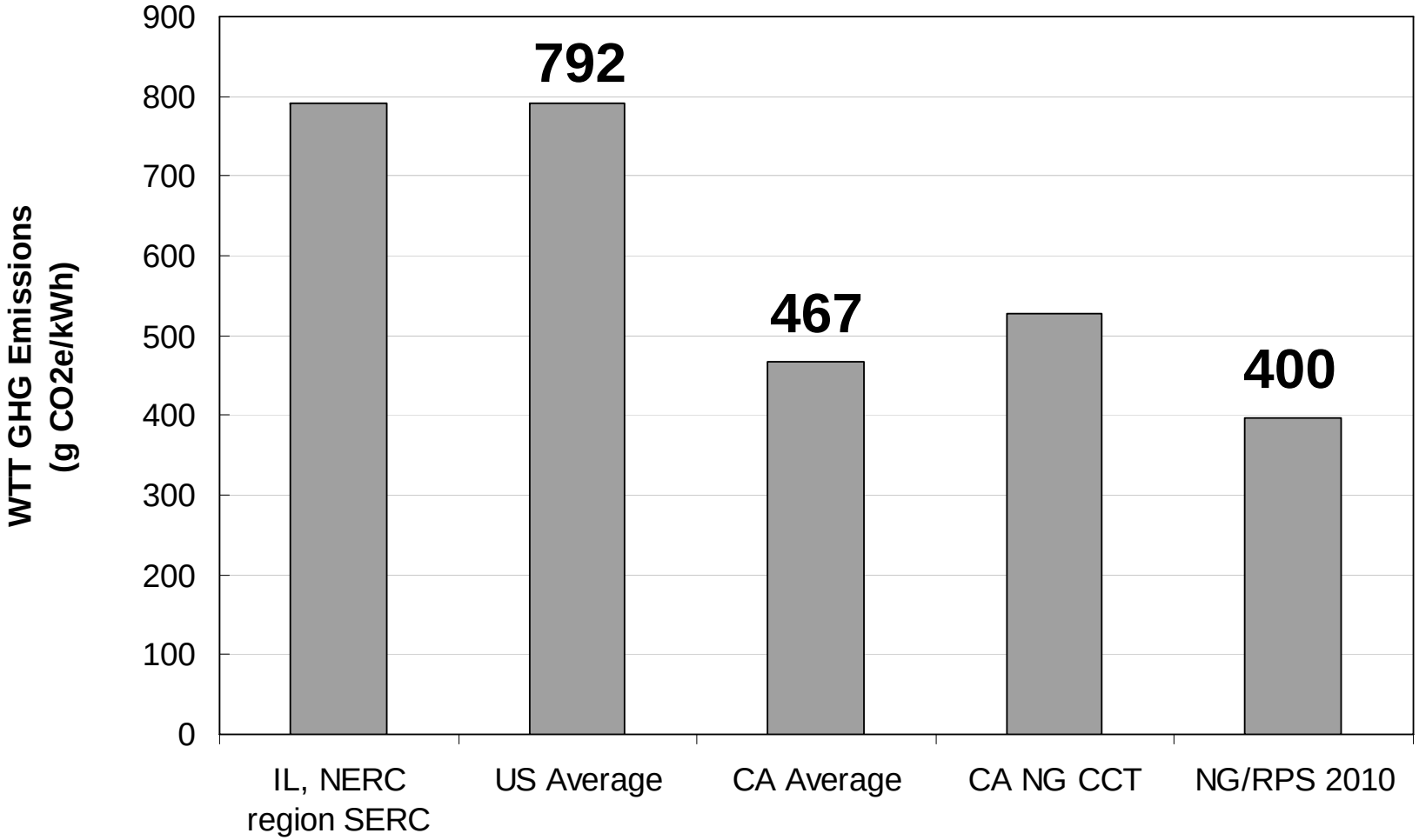
- Obtain the resource mix for electricity for the region or nation
- Calculate the LC emissions from the resource mix
- Credit the fuel pathway for an equivalent emissions reduction

Electricity Generation Resource Mix

	IL (NERC region) SERC	U. S. Ave.	CA Ave.	CA NG CCT	NG/RPS 2010
Residual Oil	1.77 %	2.70 %			
NG	10.01 %	18.90 %	41.50 %	78.70 %	78.70 %
Coal	57.30 %	50.70 %	15.70 %		
Nuclear	25.17 %	18.70 %	12.90 %		
Biomass	1.91 %	1.30 %	2.10 %		
Other	3.83 %	7.70 %	27.80 %	21.30 %	21.30 %

2006 Net System Power Report, Energy Commission Publication # CEC-300-2007-007. (Acrobat PDF, 8 pages, 48 kilobytes, date on line April 12, 2007)

Co-product Credit for Electricity (as function of generation mix)



- Analysis by Life Cycle Associates

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Land Use Change

- Several efforts undertaken by ARB to include land use change issues in LCA
  - Contracts with UCB and UCD to provide technical assistance on addressing this issue
  - CEC working on contracts to initiate efforts on estimating impacts of land use change
  - Co-ordinate with DOE/USEPA/USDA and Argonne National Laboratory (Michael Wang) on their efforts to assess land use change impacts

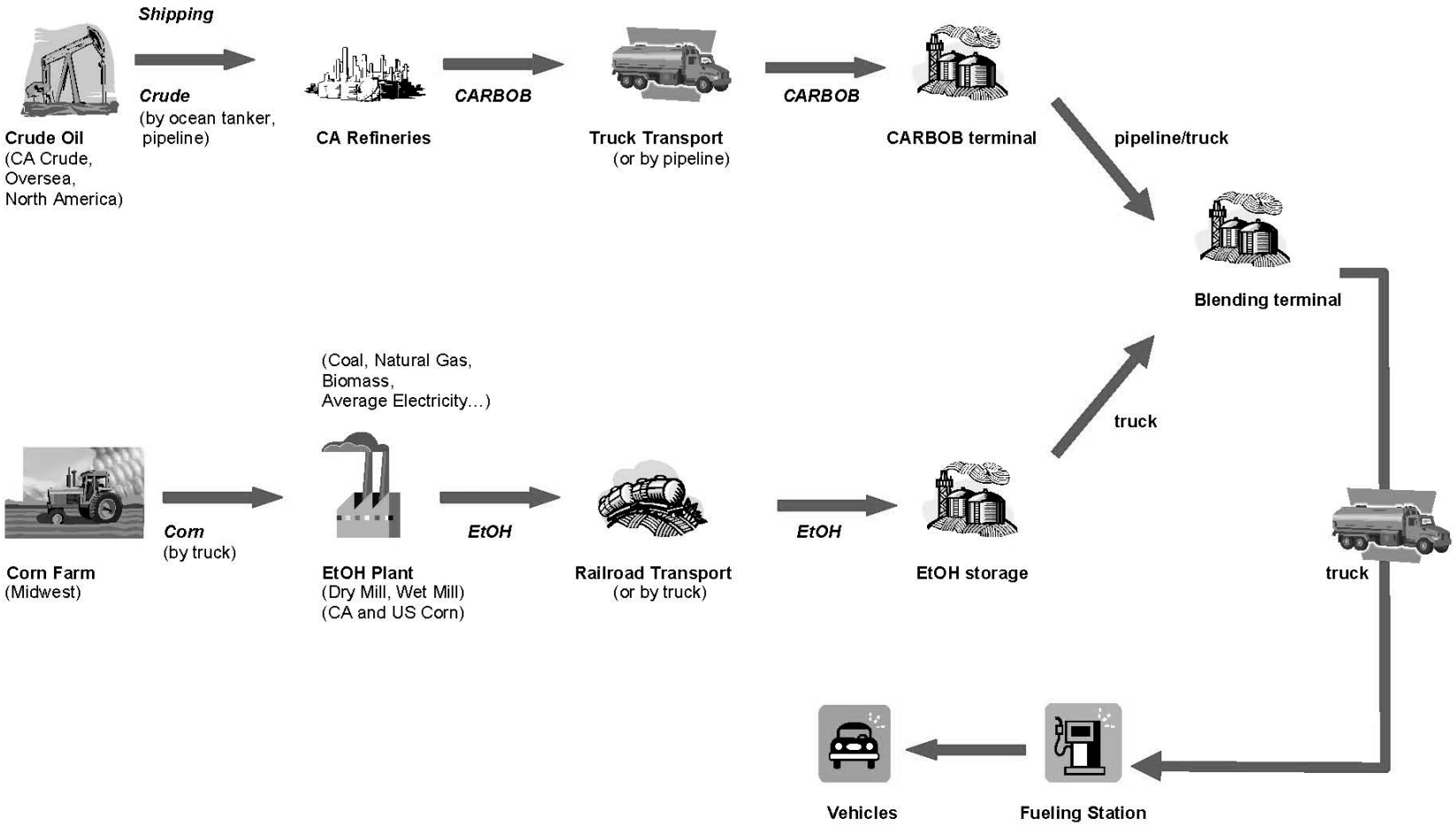
Stakeholder Presentations

- Presentation by UC Berkeley
- Presentation by University of Nebraska, Lincoln, NE.
- Other Presentations?

Potential Fuel Pathways

- Potential Feedstock-Fuel Pathways (~ 65) to be considered in the LCFS is posted online
- Additional pathways will be considered

Example CaRFG Pathway



Sustainability Issues

Land Erosion

Eutrophication

Biodiversity

Health impacts from agrochemicals use

Water Use

Water Pollution

Displacement of Indigenous People

Environmental Justice

Labor Law Violations

Existing Regulatory Frameworks

United Kingdom **RTFO (2008-2011)**	**Germany** **(Proposed by Meo-Consulting)**
• Focuses on utilizing existing standards (eg. SAN/RA, RSPO EurepGAP, ACCS, LEAF) • Acceptable standards must satisfy: Sustainability indicators and audit requirements • Sustainable criteria do not apply to co-products until they have greater than 10% of economic value at farm-gate (re-evaluate in future)	• Certification-based scheme will allow the use of existing standards • Covers all biomass (independent of the final use) • Certification will focus on the most pressing issues such as biodiversity and carbon storage • Prohibits: Conversion of high-carbon storing land and conversion of high-biodiversity land • Sustainability certificates will be traded in a book and claim system

Sustainability (future work)

- Sustainability needs to be addressed as we move into the future
- We intend to look at acceptable practices on sustainability

Next Meeting

- Next Meeting Date: to be provided in the future

For More Information

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  http://www.arb.ca.gov/fuels/lcfs/lcfs.htm

Open for Discussion